



INTERFACIAL BONDING ENHANCEMENT BY RESIN FILM FOR DOUBLE-LAYER COMPOSITES STRUCTURE BASED ON OVERMOLDING PROCESS

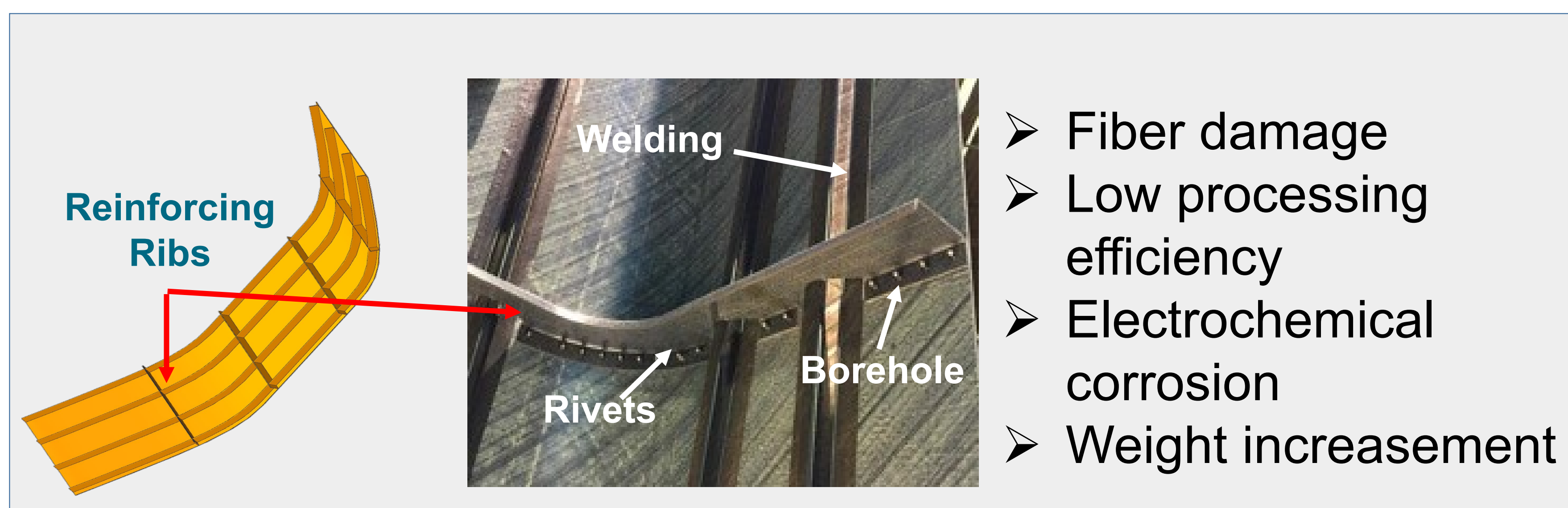


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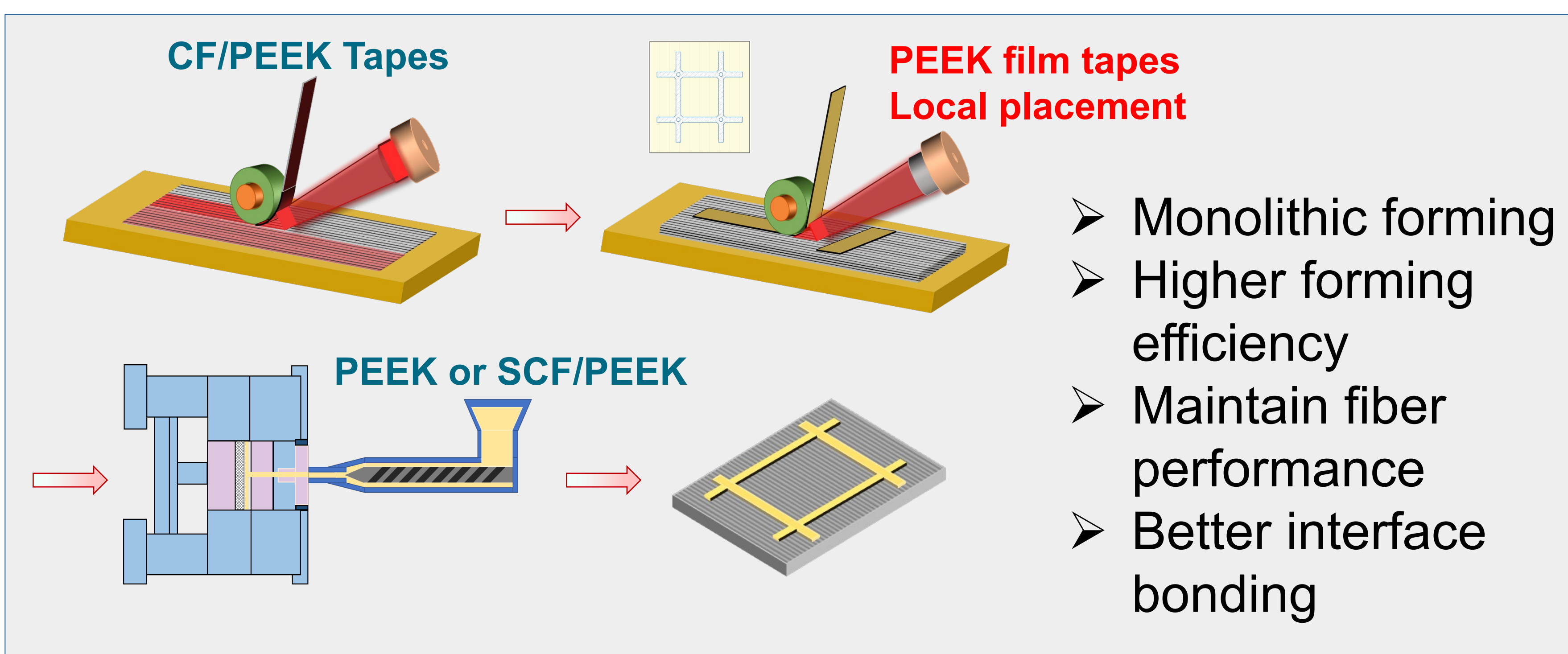
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Introduction

Complex multi-layer composite components

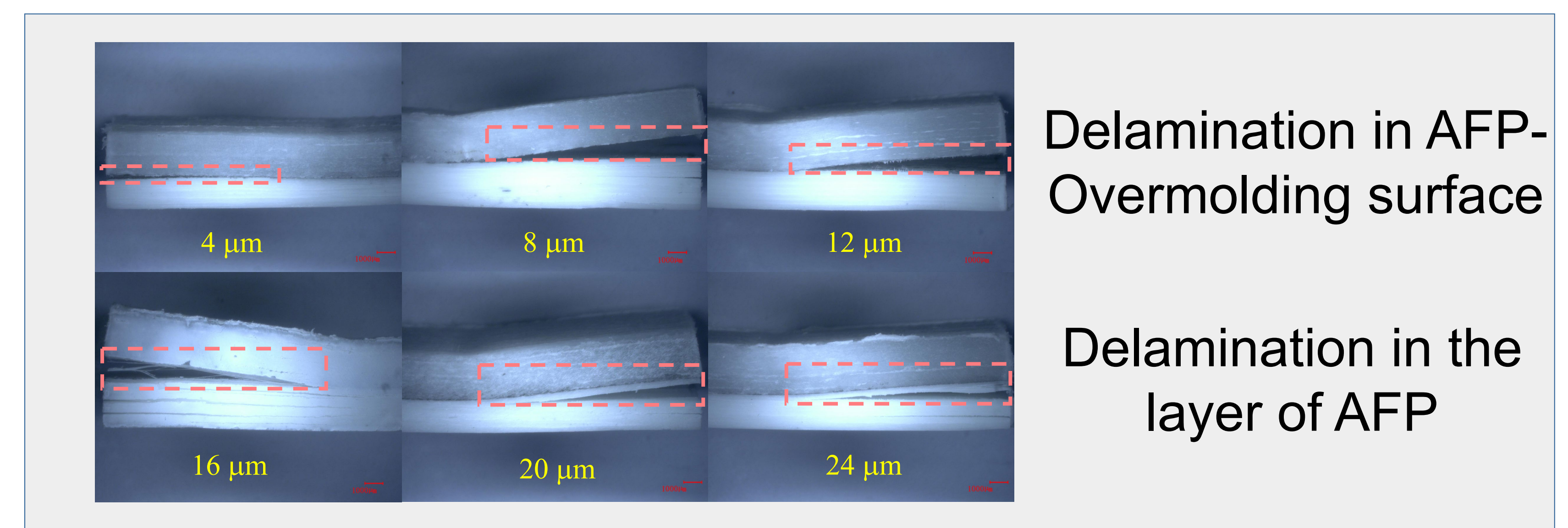
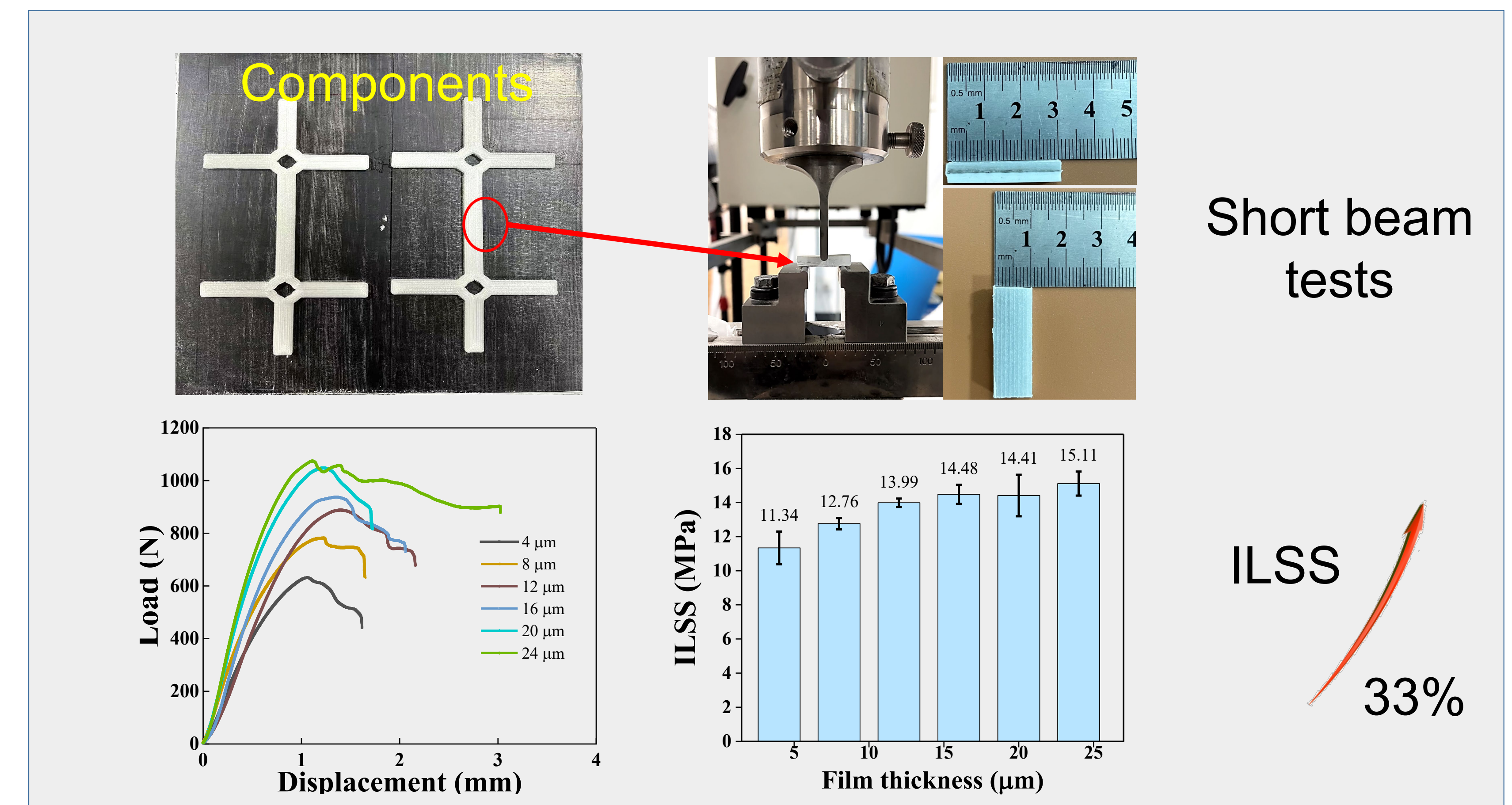


Separate forming



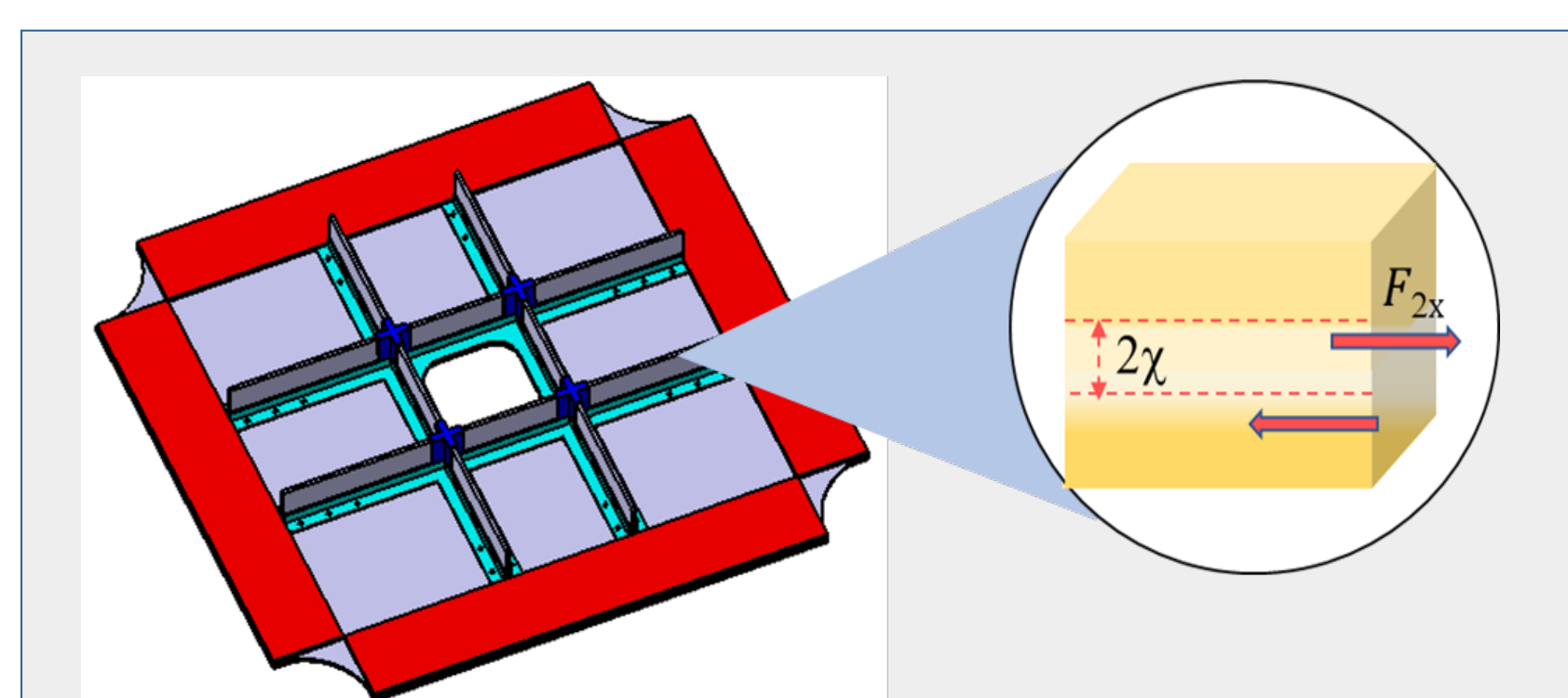
AFP-Overmolding forming

Results



Resin content-dependent enhancement model

Molecular interdiffusion effect

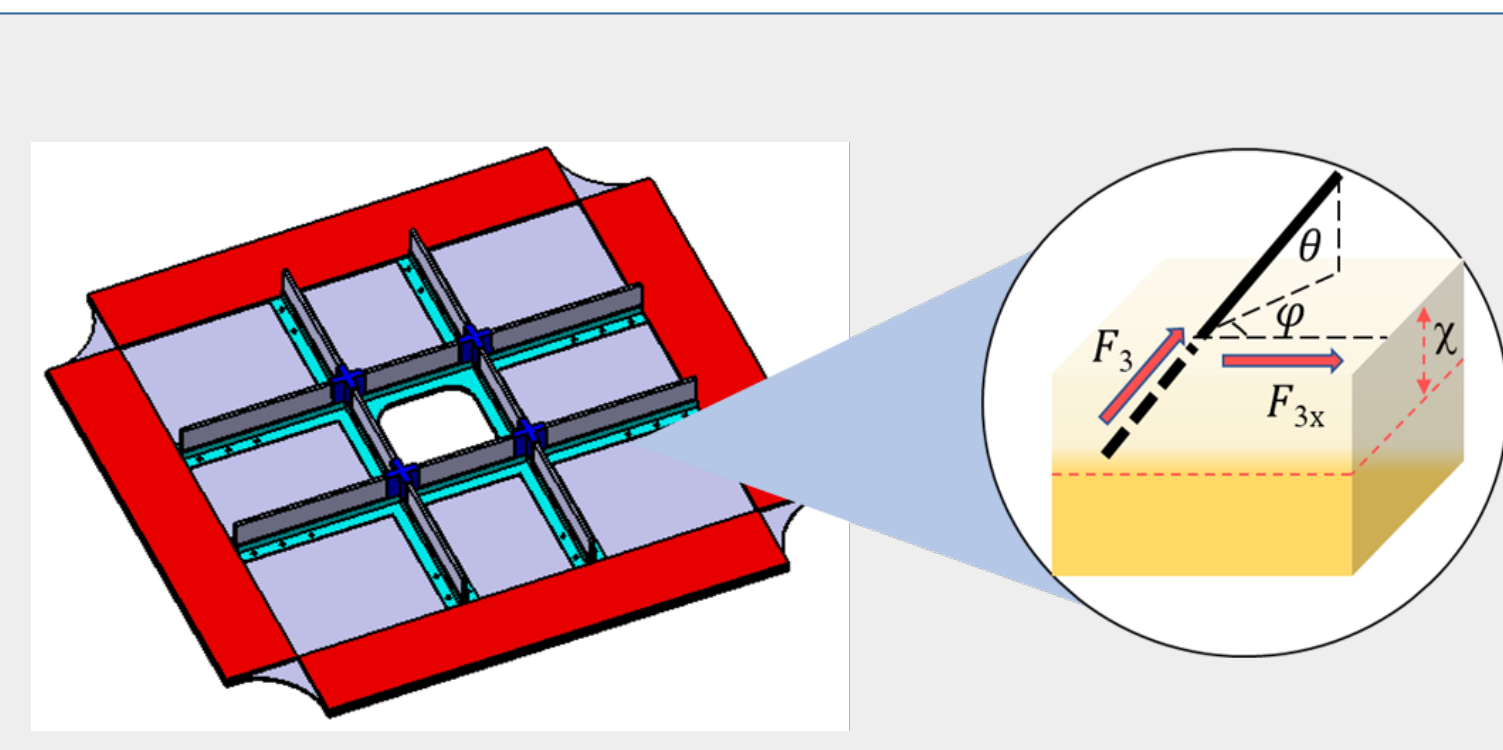


Key factors

- Interface temperature
- Interface resin content

$$D_h(t) = \begin{cases} \frac{\chi}{\chi_\infty} = \left[\int_0^t \frac{1}{t_w(T_i)} dt \right]^{1/4}, & 0, T_i < T_{cr1} \\ \frac{\chi}{\chi_\infty} = \frac{\sigma_{2x}}{\sigma_\infty}, & T_{cr1} < T_i < T_{cr2} \\ \frac{\chi}{\chi_\infty} = \frac{\sigma_{2x}}{\sigma_\infty}, & T_{cr2} < T_i \end{cases}$$

Fiber pinning effect

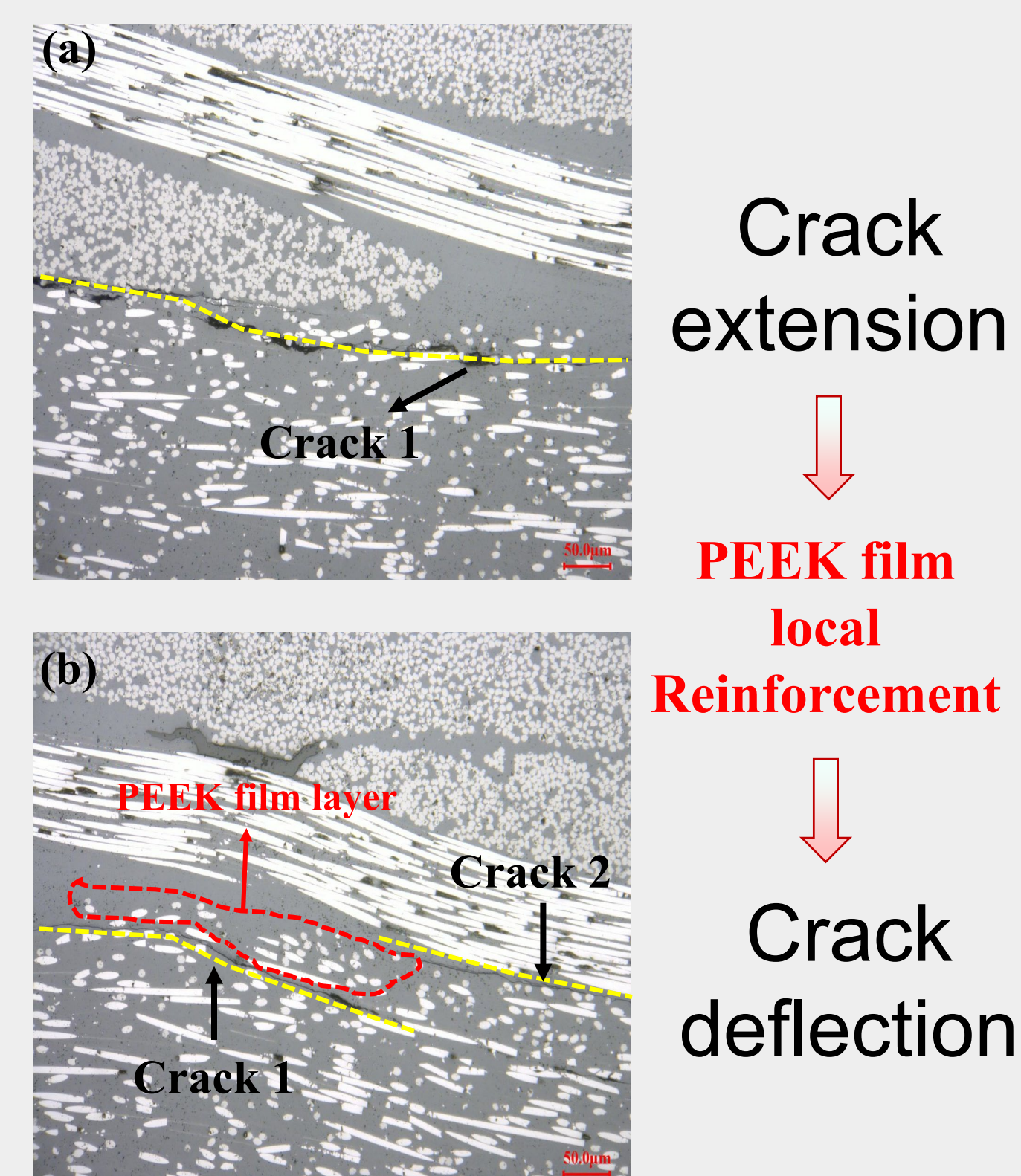


Key factors

- Thickness of healing resin on interface
- Short fiber content

$$F_{3x} = \begin{cases} \left[\int_0^t \frac{1}{t_w(T_i)} dt \right]^{1/4} \cdot \frac{\chi_\infty \tau_{ifss} \sqrt{\sigma_{xx}} C_f \rho_{PEEK}}{(1 - C_f) \rho_{CF} + C_f \times \rho_{PEEK}} \cdot \frac{2S}{r}, & 0, T_i < T_{cr1} \\ \frac{\sigma_{2x}}{\sigma_\infty} \cdot \frac{\chi_\infty \tau_{ifss} \sqrt{\sigma_{xx}} C_f \rho_{PEEK}}{(1 - C_f) \rho_{CF} + C_f \times \rho_{PEEK}} \cdot \frac{2S}{r}, & T_{cr1} < T_i < T_{cr2} \\ \frac{\sigma_{2x}}{\sigma_\infty} \cdot \frac{\chi_\infty \tau_{ifss} \sqrt{\sigma_{xx}} C_f \rho_{PEEK}}{(1 - C_f) \rho_{CF} + C_f \times \rho_{PEEK}} \cdot \frac{2S}{r}, & T_{cr2} < T_i \end{cases}$$

Crack expansion path

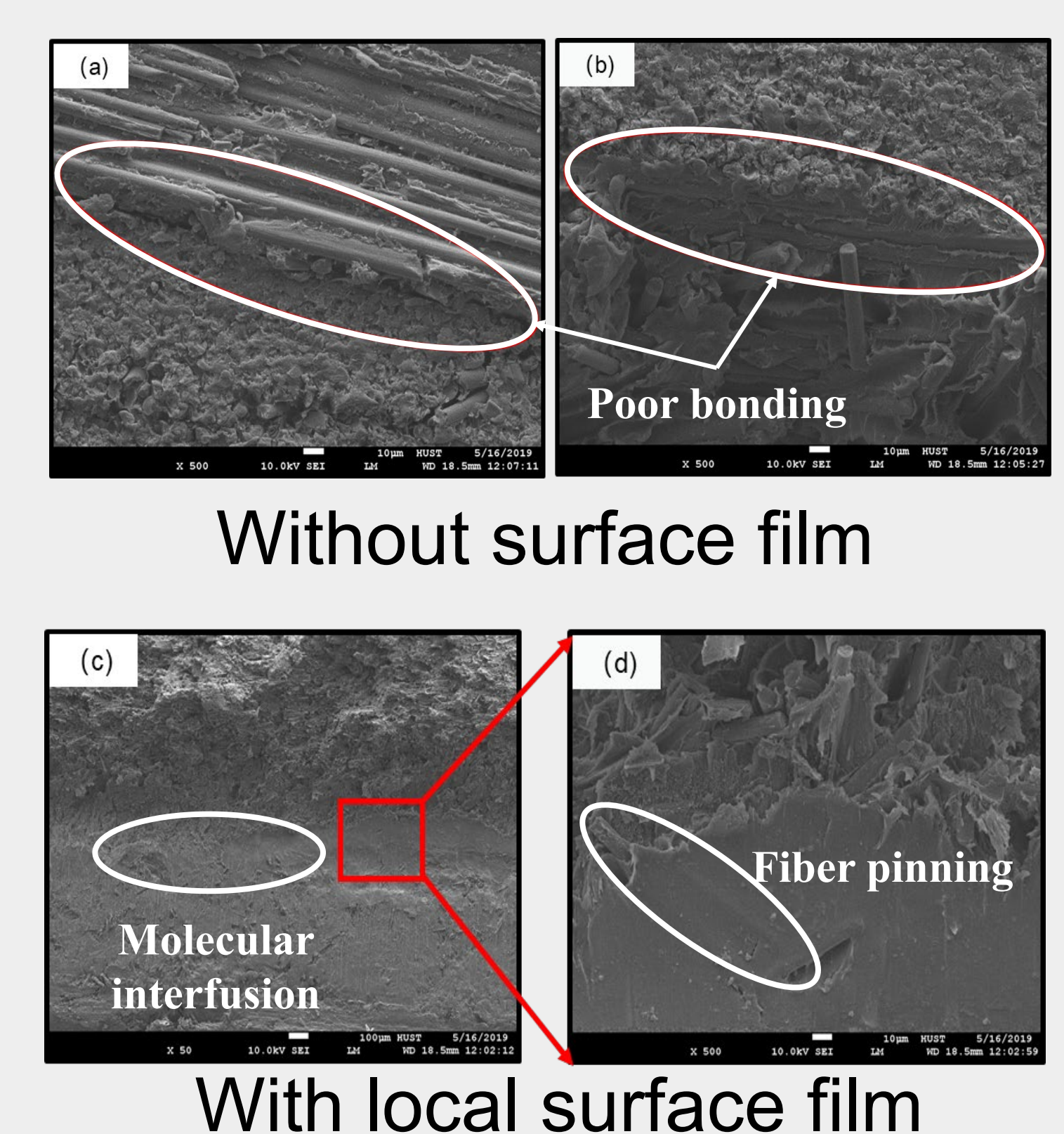


Crack extension

PEEK film local Reinforcement

Crack deflection

Cross-sectional morphology



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Research Topics:

Thermoplastic; Interface; Modelling; Automated fiber placement; Additive manufacturing; Overmolding;



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